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THE PRESERVATION OF CATERPILLARS BY INFLATION.

BY SAMUEL H. SCUDDER.

MANY persons are deterred from collecting caterpillars, by the difficulty and expense of preserving them in the ordinary way. The easy and inexpensive method of blowing up and mounting the pellicle is so little known in this country, that at the last meeting of the American Association, only one entomologist besides myself had ever seen the operation; since then, others have tried it and been delighted with its simplicity. In the hope of inducing all our entomologists to experiment for themselves, the following explanation of the process has been prepared.

It should be premised that caterpillars may be prepared in this way so as to retain their colors far better than by any other method and often to be fit subjects at any subsequent time for the artist's pencil; the most delicate processes may be preserved uninjured, and the examination of hairy or spiny appendages made even more readily than during life. Specimens taken from spirits, unless absolutely naked, are always difficult to examine from the matting of the hairs; and the internal organs can seldom be studied, even in the rudest manner, unless the greatest care has been bestowed upon their preservation; in fact, no specimen can be fitted by any process, for the study of both internal and external organizations, and for the latter, no method of preparation compares with that of inflation.

Entered, according to Act of Congress, in the year 1874, by the PEABODY ACADEMY OF SCIENCE, in the Office of the Librarian of Congress, at Washington.

The instruments necessary for the operation, besides the tools in the hands of every entomologist, are a small tin oven, a spirit lamp, a pair of finely pointed scissors, a bit of rag, a little fine wire and a straw.

The oven is simply an oblong tin box, about 2½ inches high, 2½ inches wide and 5 inches long; the cover is of glass, and one end of the box is perforated by a circular hole 1¼ inches in diameter. It would be well to have this end of glass, and the opposite end should be movable; the oven rests upon an open standard of twisted wire or riveted tin plates, as in the woodcut (Fig. 76). No soldering should be used upon the oven or standard, as it would soon be melted. Mr. Riley suggests that there would be an advantage in having the front end of the standard higher than the back as he has shown in the sketch. He also proposes a movable wire loop indicated in the woodcut by the dotted line;* but this would seem superfluous.

Fig. 76.

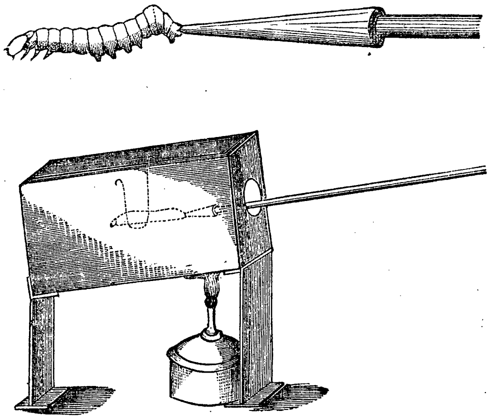
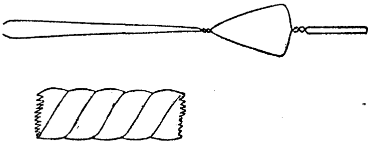


Fig. 77.



The wire should be very fine and annealed; the best is that wound with green thread and used for artificial flowers. It should not be more than half a millimetre in diameter; the cut represents it magnified nineteen diameters (Fig. 77).

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*The engraver should have made this loop hang from the edges of the oven.

The straw. Mr. Goossens of Paris, my courteous instructor in this art, who possesses a collection of nearly a thousand species of inflated caterpillars, uses nothing but ordinary wheat straw, choosing stout, dry pieces of various sizes, the cross section of which is perfectly circular; with these he inflates the smallest micros and the largest sphingidæ. Various modifications have been suggested; a glass tube drawn to a fine point, and provided with a pair of spring clips to attach to the caterpillar, is a favorite form; the Germans use this largely, and sometimes attach the caterpillar by threads passed around the anal prolegs. Dr. Le-Conte informs me that Dr. Gemminger uses a finely pointed tube with an elastic bulb attached like a rubber syringe. Mr. Riley suggests (as his drawing represents) still another mode, which is to pierce a piece of soft wood along the grain with a fine heated wire and then sharpen to a point the tube thus formed, to be inserted in the caterpillar; a tube is also inserted in the other end (see Fig. 76). For myself I prefer the simple straw.

The operation. Kill the subject by a drop of ether or by a plunge in spirits; if it be a hairy caterpillar it should remain at least half an hour in alcohol and then rest on bibulous paper for forty-eight hours; otherwise the hairs drop off in the subsequent operation. Then placing the caterpillar in the left hand, so as to expose its hinder extremity beyond the gently closed thumb and first two fingers, enlarge the vent slightly at the lower edge by a vertical cut with the scissors; next lay the larva either upon bibulous paper on the table, or upon soft cotton cloth held in the left hand, and press the extremity of the body with one finger, always with the interposition of cloth or paper, so as to force out any of the contents of the rectum; this process is continued from points successively farther back, a slight additional portion of the contents of the body being gently pressed out with each new movement; throughout all this process, great care should be taken lest the skin should be abraded by too violent pressure, and lest any of the contents of the body soil its exterior or become entangled in the hairs or spines; to avoid the latter, the caterpillar should be frequently removed to a clean part of the cloth or paper. When a portion of the intestinal tube itself becomes extended it should be seized with a pair of strong forceps, and, the head remaining in the secure hold of the left hand, the tube should be forcibly but steadily torn from its attachments ; with this, most of the contents of the body will be withdrawn and a delicate pressure passing from the head toward the tail will reduce the subject to a mere pellicle.

The alcohol lamp is now lighted and placed in position beneath the oven ; a straw is selected, of the proper size to enter the enlarged vent, and the tip, after being cut diagonally with sharp scissors, is moistened a little in the mouth (to prevent too great adhesion of the skin to the straw) and carefully introduced into the opening of the caterpillar ; the process may be aided by blowing gently through the straw. When the skin is slipped upon all sides of the straw to the distance of nearly a quarter of an inch, without any folding of the skin and so that both the anal prolegs protrude, a delicate pin (Edelston and Williams, No. 19, is best) is passed through the anal plate and the straw.

By this time the oven will be sufficiently heated to commence the drying process, which consists simply in keeping the caterpillar in the oven extended horizontally upon the straw by blowing gently and steadily through the straw, as one uses a blow-pipe. Too forcible inflation will make the caterpillar unsightly by distending unnaturally any spot that may have been weakened or bruised in the previous operation; the caterpillar should be kept slowly but constantly turning, and no harm will result from withdrawing the creature from the oven and allowing it to collapse, to gain breath or rest; only this relaxation should be very brief. The caterpillar should be first introduced into the oven while inflated by the breath, and so placed that the hinder extremity shall be in the hottest part, directly above the flame, for it is essential that the animal should dry from behind forward; yet not altogether, for as soon as the hinder part has begun to stiffen (which can readily be detected by withholding the breath for a second), the portion next in front should receive partial attention and the caterpillar moved backward and forward, round and round over the flame. During this process any tendency of the caterpillar to assume unnatural positions may be corrected—at least in part—by withdrawing it from the oven and manipulating it; during inflation, the parts about the head should be the last to dry and should be kept over the flame until a rather forcible touch will not cause it to bend.

To secure the best results it is essential that the oven should not be too hot, the flame should not be more than an inch high and its tip should be one or two inches from the bottom of the oven.

When the skin of the caterpillar will yield at no point, it is ready for mounting. The pin is removed from the straw and the caterpillar skin, which often adheres to the straw, must be gently removed with some delicate, blunt instrument or with the finger nail.

A piece of wire a little more than twice the length of the caterpillar is next cut, and, by means of forceps, bent as in Fig. 77, the tips a little incurved; a little shellac* is placed at the distal extremity of the loop, the wire is held by the forceps just beyond this point, so as to prevent the free ends of the wire from spreading, and they are introduced into the empty body of the caterpillar as far as the forceps will allow; holding the loop and gently opening the forceps, the caterpillar is now pushed over the wire with extreme care, until the hinder extremity has passed half-way over the loop and the shellac has smeared the interior sufficiently to hold the caterpillar in place when dry; the extremities of the parted wires should reach nearly to the head. Nothing remains but to curve the doubled end of the wire tightly around a pin with a pair of strong forceps and to place the specimen, properly labelled, in a place where it can dry thoroughly for two or three days before removal to the cabinet.

For more careful preservation and readier handling Mr. Goossens employs a different method, placing each specimen in a glass tube, like the test tube of the chemist. The wire is first bent in the middle and the bent end inserted in a hole bored in the smaller end of a cork of suitable size, so as nearly to pass through it; the loops are then formed as above; both ends of the cork are varnished, and a label pasted around the portion of the cork which enters the tube, thus guarding both specimen and label from dust, and the latter from loss or misplacement. After two or three days the cork with the caterpillar attached is placed in its corresponding tube and the tube may be freely handled.

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* To prepare this, the sheets of dark shellac should be preferred to the light, and dissolved in forty per cent. alcohol.

Modifications of this system will occur to every one. Dr. Gemminger uses a syringe for the extraction of the contents as well as for the inflation of the emptied skin. For an oven, the Vienna entomologists employ an ordinary gas-chimney open at both ends and inserted in a sand bath, which prevents perhaps the danger of too great heat.

NOTES ON THE CYPRINOIDS OF CENTRAL NEW JERSEY.

BY CHARLES C. ABBOTT, M. D.

THE family of fishes known scientifically as the Cyprinidæ, and popularly as "shiners" and "minnows," is well represented in the Delaware river and its tributaries. A careful study of the several species of cyprinoids found in the immediate vicinity of Trenton, N. J., convinces us how difficult it is to define clearly the distinctive characters of many of these fishes, even with a very large number of specimens to guide us; the tendency to vary in color and fin arrangement being especially noticeable. Therefore, while we have ventured to describe, as new to science, a small cyprinoid, collected by us, for the first time, during the season of 1873, we have purposely confined our notes to the species gathered here in large numbers, and not included in several small collections received from other portions of the state. While, therefore, we propose to give the full list of species, found in but a small fraction of the state's territory, we believe it really presents the entire cyprinoidal fauna of the state.

In his admirable synopsis,* Prof. Cope mentions twelve species, of six genera, belonging to the Delaware and its tributaries. The study of the material at our command enables us to recognize, without difficulty, all of these as described and figured in the synopsis referred to; but there is also, it must be mentioned, many specimens that we have considered as species, as defined by Prof. Cope, in which variations exist, that are of sufficient importance, it would seem, to make them even more than marked varieties—

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* Synopsis of the Cyprinidæ of Pennsylvania: Transactions of American Philos. Soc., vol. xiii.